

CLAIMS

WHAT IS CLAIMED IS:

1. A binder composition, which comprises:
an organic acid and/or an inorganic acid including a phosphate ion;
a polyacid; and
a primarily aqueous solvent.
2. A binder composition according to claim 1, further comprising a colorant.
3. A binder composition according to claim 1, wherein about 70 wt.% to about 90 wt.% of said composition is water.
4. A binder composition according to claim 1, wherein said organic acid comprises at least one compound comprising a phosphate ion.
5. A binder composition according to claim 1, wherein said organic acid comprises citric acid.
6. A binder composition according to claim 1, wherein said organic acid comprises phytic acid.
7. A binder composition according to claim 2, wherein said colorant comprises a pigment suspended as particles in said composition and a dye dissolved in said composition.
8. A binder composition according to claim 1, wherein said composition has a pH ranging from about 2.5 to about 5.5.

9. A binder composition according to claim 1, which further comprises at least one alcohol.

10. A binder composition according to claim 9, wherein said alcohol is present ranging from about 0.5 wt.% to about 13.0 wt.%.

11. A binder composition according to claim 1, wherein said polyacid is composed, at least in part, of (meth)acrylic monomers.

12. A binder composition according to claim 1, which further comprises at least one surfactant and/or at least one humectant.

13. A method for freeform fabrication of a three-dimensional object, which comprises:

iteratively infiltrating individual layers of powder including a polymer and at least one inorganic phosphate, with a primarily aqueous binder composition comprising a polyacid which reacts at least with said inorganic phosphate, and further comprising an organic acid and/or an inorganic acid including a phosphate ion,

wherein the infiltrated powder layers are formed adjacent to one another to form said three-dimensional object.

14. A method according to claim 13, wherein the primarily aqueous binder composition further comprises a colorant.

15. A method according to claim 13, wherein said at least one inorganic phosphate comprises one or more compounds selected from the group consisting of monocalcium phosphate, dicalcium phosphate, tricalcium phosphate, and tetracalcium phosphate.

16. A method according to claim 13, wherein said polymer is one or more aliphatic hydrocarbons.

17. A method according to claim 13, wherein said polymer is one or more vinyl polymers.

18. A method according to claim 13, wherein said powder further comprises a nanofiller which swells when contacted with water from said aqueous binder composition.

19. A method according to claim 18, wherein said nanofiller is selected from the group consisting of clay minerals, layered double hydroxide, hydrotalcite, alumina, silica, and preformed polymer-layered inorganic nanocomposite.

20. A method according to claim 13, wherein about 70 wt.% to about 90 wt.% of said binder composition is water.

21. A method according to claim 13, wherein said organic acid in said binder composition comprises at least one compound comprising a phosphate ion.

22. A method according to claim 13, wherein said organic acid in said binder composition comprises citric acid.

23. A method according to claim 13, wherein said organic acid in said binder composition comprises phytic acid.

24. A method according to claim 14, wherein said colorant comprises a pigment suspended as particles in said composition and a dye dissolved in said composition.

25. A method according to claim 13, wherein said binder composition has a pH ranging from about 2.5 to about 5.5.

26. A method according to claim 13, wherein said binder composition further comprises at least one alcohol.

27. A method according to claim 26, wherein a total alcohol content ranges from about 0.5 wt.% to about 13.0 wt.%.

28. A method according to claim 13, wherein said polyacid in said binder composition is composed, at least in part, of (meth)acrylic monomers.

29. A method according to claim 13, wherein said binder composition further comprises at least one surfactant and/or at least one humectant.

30. A freeform fabrication apparatus, which comprises:
a liquid ejection head; and
a liquid binder composition, including,
 an organic acid and/or an inorganic acid including a phosphate
ion;
 a polyacid; and
 a primarily aqueous solvent.

31. A freeform fabrication apparatus according to claim 30, wherein said binder composition further comprises a colorant.

32. A freeform fabrication apparatus according to claim 30, wherein said liquid ejection head comprises an inkjet printhead.

33. A freeform fabrication apparatus according to claim 30, wherein said inkjet printhead is a thermal inkjet printhead.

34. A freeform fabrication apparatus according to claim 30, wherein said inkjet printhead is a piezoelectric inkjet printhead.

35. A freeform fabrication apparatus according to claim 30, wherein about 70 wt.% to about 90 wt.% of said binder composition is water.

36. A freeform fabrication apparatus according to claim 30, wherein said organic acid comprises at least one compound comprising a phosphate ion.

37. A freeform fabrication apparatus according to claim 30, wherein said organic acid comprises citric acid.

38. A freeform fabrication apparatus according to claim 30, wherein said organic acid comprises phytic acid.

39. A freeform fabrication apparatus according to claim 31, wherein said colorant comprises a pigment suspended as particles in said composition, and a dye dissolved in said composition.

40. A freeform fabrication apparatus according to claim 30, wherein said binder composition has a pH ranging from about 2.5 to about 5.5.

41. A freeform fabrication apparatus according to claim 30, wherein said binder composition further comprises at least one alcohol.

42. A freeform fabrication apparatus according to claim 41, wherein said alcohol is present ranging from about 0.5 wt.% to about 13.0 wt.%.

43. A freeform fabrication apparatus according to claim 30, wherein said polyacid is composed, at least in part, of (meth)acrylic monomers.

44. A freeform fabrication apparatus according to claim 30, wherein said binder composition further comprises at least one surfactant and/or at least one humectant.